

## Section 8-3: Solve Systems by Substitution

**By the end of this lesson, you should be able to answer:**

- How do you solve systems of equations using substitution?

**Where you might see this in the real world:**

- Transportation, construction, sports, recreation

Define the following term:

1. Substitution

Example 1: Solve  $y = 3x - 2$  when  $x = 3$ .

What you did above is substitution. We allowed  $x$  to represent the number 3.  $x$  is just a variable, which is only a place-holder.  $x$  could be a number, another variable, or even an expression. It is this idea that will allow us to solve systems in a new method.

Here are the steps that will need to be followed:

1. Solve one of the equations for one variable (you get to choose which one).  
Sometimes one of the equations will already be solved for a variable.
2. Substitute the whole expression into the other equation and solve for the missing variable (there will be only one).
3. Substitute this new value back into one of the original equations to find the second variable.
4. Rewrite your answer as an ordered pair and check it in both of the original equations.

Example 2: Solve the system of equations and check.

$$\begin{cases} 4x + 3y = 27 \\ 2x - y = 1 \end{cases}$$

You might have noticed that it required fewer steps to solve the second equation for  $y$ , but you could have solved either of the equations for either of the variables. The choice is up to you; you just need to decide.

Example 3: In a two-digit number, the sum of the digits is 9. The number is 12 times the tens digit. Find the number using a system of equations.

Example 4: Solve each system of equations. Check your solution.

a. 
$$\begin{cases} x - 2y = 7 \\ -2x + 4y = -14 \end{cases}$$

b. 
$$\begin{cases} 2x - 7y = -2 \\ -4x + 14y = 3 \end{cases}$$

Problem Set:

***“I have high expectations for you, so I will wait a little longer. I know you can get it if I give you a chance.” - Myra and David Sadker***